



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,239	09/03/2004	Hari Hariharan	GEMS8081.228	5238

27061 7590 08/16/2006

ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (GEMS)  
14135 NORTH CEDARBURG ROAD  
MEQUON, WI 53097

EXAMINER
----------

VAUGHN, MEGANN E

ART UNIT	PAPER NUMBER
----------	--------------

2859

DATE MAILED: 08/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/711,239		HARIHARAN ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Megann E. Vaughn		2859	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 June 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 and 21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Newly submitted claim 1 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

The amendment to independent claim 1 that mentions "a target amplitude for a majority of echoes in the multi-echo acquisition is substantially uniform and a maximum echo amplitude of the majority of echoes is substantially equal to the target amplitude," which wasn't originally in the independent claim 1, or any of the dependent claims 2-8, of the elected invention I that was made final in the Non-Final Office Action dated 3/22/2006. Therefore, because this amendment changes how the computer determines a given scan prescription and there was no suggestion in the claim language that the computer would require setting the target amplitude equal to the maximum echo amplitude in the apparatus claims searched originally, an entirely new search is necessary, making the amended claim 1 independent from the apparatus originally presented.

As mentioned previously in the Non-Final Office Action dated 3/22/2006, the apparatus (invention I) originally claimed in claims 1-8 and the method and computer program claimed in claims 9-20 are two separate inventions because the originally claimed apparatus in claims 1-8 does not require setting the target amplitude equal to the maximum echo amplitude, therefore the restriction filed on 3/22/2006 stands and is considered final as explained in the previous action.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, amended claim 1 is withdrawn from consideration as being directed to a non-elected invention, and claim 1 filed on will be prosecuted in the present office action. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Response to Arguments***

2. Applicant's arguments filed 6/21/2006 have been fully considered but they are not persuasive.

Arguments regarding claims 1-8 are not pertinent to the version of claim 1 that is being explained since the amended claim 1 was withdrawn from consideration as stated above in paragraph 1.

Arguments regarding claim 21 are not persuasive because the applicant argues that the polynomial expressions disclosed by LeRoux are different than the polynomial expressions disclosed by the applicant because the "polynomials claimed by applicant describe flip angles as a function of echo number and are dependent on the target tissue T1 and T2 (Remarks, page 10)", but claim 21 does not mention anything about T1 and T2.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2859

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 21 is rejected under 35 U.S.C. 102(b) as being anticipated by LeRoux et al (US 5345176).

Regarding claim 21, LeRoux et al discloses in figure 1, an MRI apparatus comprising: a magnetic resonance imaging (MRI) system having a plurality of gradient coils (136) positioned about a bore of a magnet (146) to impress a polarizing magnetic field and an RF transceiver system (122) and an RF switch controlled by a pulse module (120) to transmit RF signals to an RF coil assembly (138) to acquire MR images; and

a computer (100) programmed to determine, in real-time, a respective flip angle for each data acquisition pulse of a pulse sequence (column 9, lines 1-10) for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi-echo acquisition (column 1, lines 13-18),

wherein the computer is further programmed to determine the respective flip angle from a selection of one of a number of stored polynomial expressions of available flip angle trains, the selected polynomial expression being most optimal of the number of stored polynomial expressions for the given target tissue and the given scan prescription (column 8, lines 30-60).

***Claim Rejections - 35 USC § 103***

Art Unit: 2859

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Alsop's The Sensitivity of Low Flip Angle RARE Imaging.

Regarding claims 1 and 3, LeRoux et al discloses in figure 1, an MRI apparatus comprising: a magnetic resonance imaging (MRI) system having a plurality of gradient coils (136) positioned about a bore of a magnet (146) to impress a polarizing magnetic field and an RF transceiver system (122) and an RF switch controlled by a pulse module (120) to transmit RF signals to an RF coil assembly (138) to acquire MR images; and

a computer (100) programmed to determine, in real-time, a respective flip angle for each data acquisition pulse of a pulse sequence (column 9, lines 1-10) for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi-echo acquisition (column 1, lines 13-18),

wherein the computer is further programmed to determine the respective flip angle from a selection of one of a number of stored polynomial expressions of available flip angle trains, the selected polynomial expression being most optimal of the number

of stored polynomial expressions for the given target tissue and the given scan prescription (column 8, lines 30-60).

Regarding claim 7, LeRoux et al discloses that the computer is further programmed to determine the respective flip angle for each data acquisition pulse (column 9, 1-12).

LeRoux et al does not disclose specifically that the flip angles are determined based on T1 and T2 characteristics of the given tissue.

Alsop discloses that the relationship between T1, T2, flip angle, and echo amplitude (page 179). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to use the equation using T1 and T2 values to calculate the flip angle because it makes the calculation more specific to the type of tissue being imaged due to the fact that T1 and T2 are different for every tissue.

Regarding claim 2, LeRoux et al discloses the computer is further programmed to determine the respective flip angle for each data acquisition pulse to maintain cumulative RF deposition during data acquisition within a prescribed level (column 9, lines 39-41).

Regarding claim 4, LeRoux discloses the MRI apparatus of claim 3 wherein the computer is further programmed to determine a most optimal polynomial expression from a target amplitude desired for a majority of echoes of the multi-echo acquisition (column 8, lines 61-63).

Regarding claim 5, LeRoux discloses the MRI apparatus of claim 3 wherein the computer is further programmed to determine a flip angle train for the pulse sequence from the number of stored polynomial expressions (column 8, lines 30-60) that will provide a less noisy image (column 1, lines 13-18) of the target tissue.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Alsop's The Sensitivity of Low Flip Angle RARE Imaging as applied to claims 1-5 and 7 above, and further in view of Loncar et al (US 6252400).

LeRoux et al discloses the MRI apparatus and computer programmed to determine the flip angle as discussed above in paragraph 5.

LeRoux et al does not specify the magnetic field strength used.

Loncar et al discloses an MRI apparatus with a magnetic field strength of 1.5 Tesla. Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to use a magnetic field of 1.5 Tesla as taught by Loncar et al because 1.5 T is a common magnetic field setting in MRI and at 1.5 T hydrogen dipoles have a well known resonance strength of approximately 64 MHz, and because of the abundance of hydrogen and its strong signal most typical MRI apparatuses are tuned to the resonant frequency for hydrogen (column 1, lines 47-53).

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Alsop's The Sensitivity of Low Flip Angle RARE Imaging as applied to claims 1-5 and 7 above, and further in view of Stuber et al (US 6230039).



With respect to claim 8, LeRoux et al discloses the MRI apparatus wherein the computer is programmed to acquire data with a fast spin echo pulse sequence (column 1, lines 13-18).

LeRoux et al does not disclose specifically that his apparatus can acquire 2D or 3D data.

Stuber et al discloses the methods and the software wherein the computer is programmed to acquire 2D or 3D MR data (column 3, lines 34-36). Therefore it would have been obvious to a person having ordinary skill in the art the time that the invention was made to program the computer to acquire both 2D and 3D images in order to enable the user to either use a single stepped gradient along a single direction or two stepped gradients along two orthogonal directions as taught by Stuber et al (column 3, lines 33-41), to acquire the best image (2D or 3D) for the specific tissue.

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2859


the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megann E. Vaughn whose telephone number is 571-272-8927. The examiner can normally be reached on 8 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MEV  
Patent Examiner 2859  
8/7/2006



**BRIJ SHRIVASTAV**  
**PRIMARY EXAMINER**